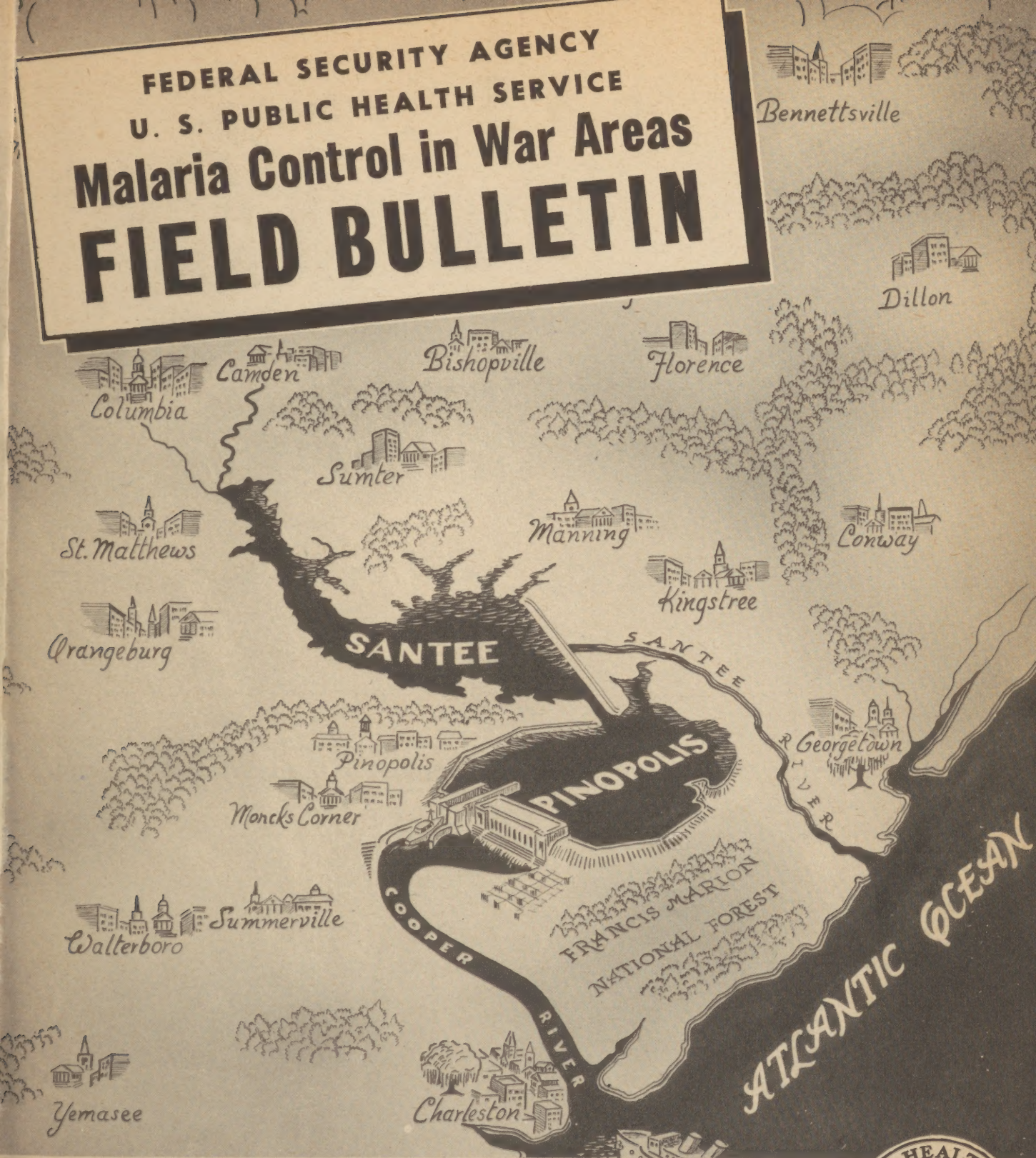


FEDERAL SECURITY AGENCY  
U. S. PUBLIC HEALTH SERVICE  
**Malaria Control in War Areas**  
**FIELD BULLETIN**



A MALARIA SURVEY OF THE SANTEE-COOPER IMPOUNDMENT  
SOUTH CAROLINA

ATLANTA, GEORGIA

JUNE, 1945



RESTRICTED



Table I

## MCWA Larvicide, Minor And Major Drainage Work

May 1 - 31, 1945

STATE	Areas in Opera- tion	Residual Number Houses Sprayed	Spraying Pounds DDT Used	LARVICIDAL WORK					DRAINAGE OPERATIONS								Total	
				Larvicide Used		Surfaces Treated Acres		Clearing Removal Surf. Veg. Acres	Cleaning Hundred Sq. Ft.	New Ditching		Ditch Lining Lin. Ft.	Underground Drainage Lin. Ft.	Fill C. Y.	Water Surf. Eliminated Acres			
				Oil Gals.	Paris Green Lbs.	Oiled	Dusted			Hand Lin. Ft.	Dynamite Cu. Yds.							
																Total Cu. Yds.		
Alabama	8	6,624	2,801	1,119	125	34	75	8	---	6,384	---	---	---	---	---	---	7,154	
Arkansas	18	29,628	8,575	37,646	1,092	1,445	612	55	1	2,994	4,009	600	---	831	335	---	46,238	
California	4	---	---	3,795	6	358	5	2	1	550	400	---	---	---	---	2	3,764	
District I	3	---	---	239	---	20	---	2	---	1,713	8,605	---	---	---	---	135	3,179	
Florida	18	2,313	1,943	1,028	667	53	428	17	4	11,327	24,856	---	1,559	2,784	577	8,512	28,654	
Georgia	12	4,695	2,962	2,157	2,157	17	1,610	27	1	1,452	10,304	805	---	---	20	962	21,172	
Illinois	2	---	---	---	---	---	---	7	---	164	3,525	---	---	---	---	4	2,574	
Indiana	1	---	---	---	---	---	---	---	---	600	---	---	---	---	---	---	1,264	
Kentucky	5	3,421	1,192	806	4	53	1	4	---	125	238	---	---	---	---	---	7,504	
Louisiana	9	2,857	1,140	94,262	1,181	2,859	542	57	2	5,922	10,426	---	2,700	---	---	40	63,369	
Maryland	1	---	---	---	---	---	---	51	---	58	150	---	---	---	150	100	6,479	
Mississippi	18	13,721	5,748	16,045	475	396	317	80	1	4,777	4,650	---	---	102	---	16	21,162	
Missouri	4	7,760	3,790	4,522	8,350	266	2,811	4	---	97	---	---	---	---	---	---	14,078	
North Carolina	10	1,022	397	3,169	26	203	16	206	---	10,192	7,573	---	---	---	---	43	30,369	
Oklahoma	9	2,561	488	711	16	37	8	62	---	7,770	9,663	---	---	---	---	---	15,370	
Oregon	1	---	---	115	---	3	---	---	---	---	---	---	---	---	---	---	312	
Puerto Rico	7	---	---	998	2,687	45	1,238	40	1	10,582	4,670	2,200	---	---	---	---	47,448	
South Carolina	19	7,681	3,587	11,937	1,74	810	433	1,362	1	36,635	19,792	---	---	---	156	119	68,071	
Tennessee	3	4,778	2,113	3,326	46	99	16	9	2	60	3,019	---	---	980	---	59	16,313	
Texas	14	12,485	3,657	11,896	193	294	193	243	18	4,963	27,939	---	---	---	---	23	50,737	
Virginia	4	---	---	6,386	276	95	143	46	---	4,556	38,833	---	---	---	---	225	20,559	
Total	170	99,546	38,393	198,247	17,775	7,087	8,448	2,282	32	110,921	178,652	3,605	4,259	4,697	1,238	10,238	475,775	
April Total	156	56,207	19,226	112,273	6,170	6,833	4,551	842	12	126,155	279,937	530	17,298	2,839	2,462	5,572	419,441	



# A MALARIA SURVEY



## of the SANTEE-COOPER RESERVOIR SOUTH CAROLINA

Malaria has long been a serious problem in the "low country" or coastal plain region of South Carolina, particularly in the Santee River Basin of that state. In studying records collected from this area over the last ten years, it is evident that a clear-cut focus of malaria has existed and continues to exist in the vicinity of the Santee River in Clarendon, Berkeley, and Orangeburg Counties. Furthermore, these studies have indicated that in some sections malaria has increased since the 1941 impoundage of water on the Pinopolis and Santee Basins, and that minor epidemics have occurred during the seasons of 1942 and 1943 in Clarendon County near the Santee Reservoir.

Realizing the seriousness of the malaria problem in the area adjacent to the two reservoirs, the South Carolina State Board of Health and the South Carolina Public Service Authority prepared a report, early in 1944, summarizing the malaria problem around the Santee-Cooper impoundment and requested the aid of the U.S. Public Health Service in controlling the disease.

After conferring with the Surgeon General, it was proposed that an intensive survey of the area be made to secure additional data that might form the basis for a control program. The survey was to

include epidemiological, entomological, and engineering studies and was designed to furnish complete data on the reservoirs and adjacent territory.

An epidemiological survey was to secure information to supplement and confirm that already existing regarding the prevalence and distribution of the disease. It would compile and tabulate the available data on malaria incidence and would organize and direct a blood smear survey in the area immediately adjacent to the reservoirs.

The entomologists were to outline, in detail, the most favorable breeding places for *Anopheles quadrimaculatus* and were to further determine whether the principal breeding of *quadrimaculatus* was occurring in the reservoirs proper or in adjoining territory. They would also study the flight range, dispersal, and other important features of the biology of the vector in this area.

An engineering survey was to obtain more detailed data on the most feasible control methods to be employed on (1) a short-range program and (2) on a long-range malaria control program over the whole area.

### PRE-IMPOUNDMENT MEASURES

When the impoundment was first contemplated, plans were made to complete all malaria control work on the two artificial





Flooded Woods in the Santee Reservoir

lakes in accordance with the South Carolina State Board of Health impounded water regulations. Later, it was decided to modify the plans for malaria control in order to complete the dam at an earlier date and to hasten the production of electricity needed for the war effort.

On the Santee Reservoir, it was originally agreed that a strip of timber one mile wide be cleared from the expected shoreline (75 foot contour) in toward the center of the proposed pool before impoundment. This would have left a mile-wide barrier of open water separating the flooded woods in the center of the reservoir from the nearest shore. However, at a subsequent date, this agreement was modified to the extent that only a one-half mile strip was cleared in that portion of the reservoir upstream from U.S. Highway 15. This left only a half-mile strip of open water between the shore and the anopheline breeding that developed in the submerged timber in the center of that part of the impoundment.

#### PRESENT CONDITION OF THE RESERVOIRS

Of the two reservoirs, the Santee Reservoir is the largest - 30 miles long and  $3\frac{1}{2}$  miles wide on the average, with a maximum water surface of 97,000 acres and a shoreline of over 497 miles at elevation 75. The smaller Pinopolis Reservoir, connected to the Santee by a diversion canal, is about 12 miles long by 10 miles wide and has a maximum water surface of about 65,000 acres and a shoreline of 151 miles at the same elevation.

The present condition of the two reservoirs is quite different. The lower impoundment, the Pinopolis Reservoir, has been entirely cleared of standing timber and floating logs. Aquatic plants have not as yet invaded this impoundment to any extent except where they have been implanted in the Pinopolis Pool Wildlife Refuge on the south side of the lake. This refuge covers 2,000 acres, is well located, and is not considered important from the malaria standpoint at this time because few people live within flight range.

The larger Santee Reservoir, on the other hand, contains 47,112 acres of standing timber, most of it dead, with considerable floatage and piles of fallen branches. In the lower half of this reservoir, a mile-wide cleared strip of open water separates the flooded timber from the present shoreline; but in the upper half, this strip is only one-half mile in width. In some places, these zones are covered with deep water; in others, the summer recession of the water level gradually exposes acres of stumpage. In a few places, the development of secondary growth and herbaceous vegetation has created serious mosquito breeding situations. Alligator grass, in particular, threatens to become a serious problem over much of this area and will present a difficult control problem if allowed to spread further. In addition, several wildlife refuges with sustained water levels have been established on this reservoir. Where aquatic and semi-aquatic vegetation has developed, these refuges present a considerable anopheline hazard.



Alligator Grass





**Blood Smear Survey  
MALARIA PREVALENCE**

A widespread survey was undertaken in 1944 to obtain smears throughout the entire area lying within  $1\frac{1}{2}$  miles of the 75 foot contour. Smears were also obtained from more distant areas — 3-10 miles from the reservoirs — to act as controls. Some 15,000 individuals were examined in houses or at work in the fields. Complete family rosters, data regarding the condition of the house, and a history of malaria were obtained. About 6,000 houses were surveyed.

The area of highest malaria prevalence was located on the north shore of the Santee Reservoir in Clarendon County around Potato Creek, between Tawcaw and Wyboo Creeks. Here 38.7% of the 470 blood films examined proved positive for parasites. The area immediately adjacent to this section in Clarendon County and the area in Berkeley County just below the Santee Dam showed the next highest prevalence — 11.3-15.7% positive blood smears. Relatively moderate prevalence, ranging from 6.7-8.9% occurred in areas adjacent to the above mentioned high sections. The remaining areas were of relatively low degree of prevalence.

PARASITE SPECIES - POSITIVE SMEARS 1944		
SPECIES	NO. OF SMEARS	PER CENT OF TOTAL
<i>Plasmodium falciparum</i>	699	82.8
" <i>vivax</i>	52	6.2
" <i>malariae</i>	34	4.0
Mixed	2	0.2
Species undetermined	57	6.8
Total	844	100.0

As shown above, *P. falciparum* was the predominant species of parasite found. *P. malariae* occurred much less frequently but in surprising percentages for this species. Most of it was found in Berkeley and Orangeburg Counties.

All data gathered during the survey show that a serious malaria problem exists in the area adjacent to the reservoirs in parts of Berkeley, Clarendon, and Orangeburg Counties. Many of the houses showed infections in all members of the family — a few of the houses being inhabited by as many as 10-12 people. Fourteen infected mosquitoes were taken from one such house during the period of study. The Santee-Cooper reservoir area is one of the few remaining known endemic areas in the country. In most areas throughout the South, including South Carolina as a whole, the disease has been decreasing and is now at an all time low.

#### ADULT MOSQUITO SURVEYS

To compare mosquito densities in the various zones extending out from the reservoirs, "files" or series of natural resting places radiating from the impoundment were selected at different distances from the reservoirs. In addition, "intensive areas" were established for special study. These included a large number of stations per zone within a limited area to sample more adequately the population density in special areas of particular interest.

In making gross comparisons of areas, "intermediate stations" were located between the "files" to determine the anopheline density in those portions of the first mile zone not otherwise sampled. "County traplines", consisting of a line of 20 stations were set up in areas far back from the reservoirs in each of the five counties concerned. Their purpose was to determine the anopheline density in localities well removed from any possible influence of the reservoirs and to compare this density with that in zones adjacent to the impoundment. "Swamp lines" were located in the great river swamps of the Wateree, Congaree and lower Santee Rivers to determine the





Typical Adult Index Station

anopheline species present in these swamps and their relative abundance. These would be essentially similar to the reservoir areas prior to impoundment. "Special index stations" were also established in areas selected by the medical section for correlation with extensive blood smear surveys.

Weekly entomological observations were made in 550 widely scattered adult index stations from July to November 1944 in order to determine relative densities of the malaria vector. Two hundred additional stations were used for shorter periods. These stations were usually the familiar 1-2 stall mule stables found practically at every homestead in this area.

From the large amount of data collected, it was quite obvious that conditions were not uniform around the reservoirs. In some files of stations, the level of vector density was high — in others, remarkably low. In those areas of high *quadrимaculatus* population, the counts were highest near the reservoirs and associated waters and decreased progressively through successive stations away from the impoundment. This pointed to the reservoirs as the most important source of anophelines in the area.

## SOURCES OF MOSQUITOES

The upper two-thirds of the flooded woods in the Santee Reservoir were found to be the greatest single source of *quadrимaculatus* found in the entire region. The extremely high breeding intensity, the predominance of *quadrимaculatus*, and the thousands of acres available for breeding marked this area as a serious problem.

Here, the water varies from 2 to 15 ft. deep. It was slightly alkaline at the time examined and has excellent shelter for anopheline larvae in piles of fallen branches, green algal growth, and fairly abundant floatage. A steady seasonal drawdown reduced the overall area of water surface and almost eliminated marginal breeding along the shorelines. But this had no effect on adult densities being produced in the flooded woods in the interior of the reservoir. In these woods, an expansive breeding area was involved, and high larval counts continued throughout the drop from the 73 to the 68 foot level. During the height of the breeding season an average of 8-10 larvae per dip was sometimes found. This is extremely heavy breeding for such a large area and the production of adult *quadrимaculatus* was consequently great.

From one known breeding place of tremendous extent in the Santee Reservoir, *quadrимaculatus* mosquitoes were recovered in large numbers from stations as far out as a mile and a half from the 75 foot contour of the reservoir. Actually, these outermost stations were two miles from the closest point of the flooded woods. This means that these adult mosquitoes were moving at least a mile beyond the usually accepted limit of flight of *quadrимaculatus*.

## DISPERSAL EXPERIMENT

To further verify the distance of dispersal from breeding places, 3,500 wild-caught *quadrимaculatus* mosquitoes were dusted with aluminum powder and released at a known point in the flooded woods.



During the next four days, and on the sixth and eighth days, 40,863 female *quadrимaculatus* were collected and examined for marked specimens. In all, 21 (0.6%) of the 3,500 marked specimens were found. These were taken in 8 of the 15 stations examined. All of the 21 specimens were found in stations located 2.05 to 3.63 miles from the point of release. Seventeen of the 21 recoveries were made at a distance of from 2.05 to 2.5 miles.

It should be especially noted that in no case was there any intervening habitation or accompanying blood meal source between the release point and the stations where marked mosquitoes were recovered. This emphasizes the importance of distance to an adequate blood meal source in setting the limits of *quadrимaculatus* control. Under conditions of high population pressure and relative scarcity of suitable hosts, it was shown that *quadrимaculatus* will fly in dangerously large numbers much farther than the commonly accepted one mile limit.

#### CONTROL PLANS

The proposed plans for malaria control on Pinopolis and Santee Reservoirs are based on a study of (1) malaria incidence, (2) mosquito density, (3) density of human population, (4) condition of housing, and (5) condition of the reservoirs. Plans for control are designed to reduce the incidence of malaria at the earliest possible moment and to improve general conditions on a section of the reservoir each year in order to decrease maintenance costs and to increase the efficiency of control in succeeding years.

Before selecting control methods, data on the condition of the shoreline, on the condition of houses, the need for drainage, the presence of dangerous aquatic vegetation, the need for clearing partially submerged timber, floatage and debris plus the epidemiological and entomological data were carefully studied and correlated.

The more permanent type measures recommended include (1) clearing of the partially submerged timber in which

heavy breeding of *quadrимaculatus* occurred in 1944, (2) the drainage of ponds in the zone of fluctuation, (3) mosquito-proofing of houses in certain areas where control has been most difficult, (4) shoreline improvement, (5) diking and dewatering of several areas where malaria rates are high and a dense population is affected, and (6) filling of small areas to eliminate larvicidal work.

Until permanent improvements are made, it will be absolutely necessary to rely on more temporary measures to reduce the mosquito population. These temporary measures include (1) larviciding to kill the aquatic stages, (2) spraying to kill adult mosquitoes in houses, (3) removal of secondary growth from the reservoir areas, (4) the control of obnoxious plants that form favorable breeding places for *quadrимaculatus* and (5) the use of drugs to reduce infection in the human population. While it is urged that a part of the permanent program be scheduled each year, it is just as strongly recommended that these less permanent methods be carried on as soon as possible.

#### CLEARING

Since extremely heavy breeding occurred in the center of the reservoir in the 10,300 acres of uncleared timber lying between U. S. Highway 15 and the Atlantic Coast Line Railroad, and since the flight range of these mosquitoes is great enough to allow them to bite the human population living on either side of the reservoir, it is recommended that this timber be completely cleared. If not cleared, the trees will continue to fall for 20 years or longer, and stumps will be left to collect debris. By clearing the water surface, mosquito control will be made easier, and a much fuller use can be made of the reservoirs.

Timber standing in water less than 3 feet deep can best be cut by an electrically driven mechanical chain saw operated by two men walking in the lake, with a third following in a small boat carrying a portable generator to operate the saw.



In water more than 3 feet deep, timber can best be cut by a circular or pneumatically operated mechanical chain saw mounted on the front of a long, narrow shallow draft barge. The barge should be about 20 feet wide and 60 feet long. The saw should be set to cut the trees 1½ to 2 feet below the bottom of the barge. Two spuds, similar to those used on dredges, should be used to stabilize the barge in order to prevent any movement of the boat being transmitted to the saw, thus causing it to break. A design should be developed which will make it possible to swing the saw from side to side and so it can be run forward in order to clear as many square feet as possible from one position of the barge. A stiff arm mounted on the front of the barge could be used to push the timber over to one side in order to permit the barge to proceed.

To cut trees with dynamite, holes are bored at the desired height, care being taken to bore the holes at the correct angle to throw the trees in the desired direction. Holes may be bored with a 2¼ to 2½ inch augur driven by an air compressor mounted on a barge. High velocity cartridges, 2 inches in diameter by 8 inches in length, containing 60% dynamite, shot with an electric blasting cap, are recommended. It is believed that this is a very economical method of felling trees 12 inches or more in diameter.

#### MOSQUITO PROOFING

Reports filed with the State Board of Health describe the condition of each house located within 1½ miles of the 75 foot contour of both the Santee and Pinopolis Reservoirs. These records give actual measurements of doors, windows, and fireplaces to be closed, together with an estimate of amounts needed to close openings in floors, ceilings, and walls. Thus, an accurate estimate of amounts needed to mosquito-proof any house can be quickly prepared from actual measurements.

A unique method of screening windows with outside shutters designed by the South Carolina State Board of Health is shown in the accompanying photograph.



Closing Shutter thru Trapdoor in Screen  
SHORELINE IMPROVEMENT

On this impoundage, anything in the water such as stumps, roots, and partially submerged tree trunks or underbrush, tends to reduce wave action and thus encourages the growth of green multicellular algae, an ideal habitat for *quadrifasciatus* larvae. Stumps, logs and debris should be removed from the shoreline in the zone of fluctuation. If a system for conditioning the reservoir is inaugurated and heavy machinery properly scheduled and used in constant shoreline improvement, mosquito control on much of the reservoir will become automatic.



Removing Logs by Speeder Crane  
FUTURE DEVELOPMENT OF THE PROJECT

With proper development and maintenance, the Santee-Cooper impoundage can be made one of South Carolina's most valuable assets. By following a well-planned malaria control program the incidence of malaria should gradually recede and the full possibilities of the reservoirs for power, navigation, and recreation may be fully realized.



## HEADQUARTERS NOTES

### DENGUE FEVER AGAIN REPORTED IN HAWAII

Seven cases of dengue fever were reported in Hawaii during the month of June. Special control measures included the spraying of the interiors and exteriors of all houses within a block of homes from which the cases were reported. The last two cases were reported for June 14th and 17th respectively.

### PROFESSIONAL SEMINAR ORGANIZED

The professional staff of the Malaria Field Research Station at Manning, South Carolina, has organized a combination Staff Officers' Club and Professional Seminar. The organization will encourage regular meetings of the staff for discussing MCWA problems in the Manning area and will provide a seminar to further professional education. Meetings are held twice a month, and attempts are made to secure speakers on some subject in the field of malaria. The speaker at the June 27th meeting was P.A. Engineer (R) James Hammond, who spoke on "Toxicity of DDT."

### PROFESSIONAL PERSONNEL

During the month of June the following transfers were made: Asst. San. (R) William F. Buren from Alexandria, La. to Miami Beach, Fla.; P.A. Eng. (R) Clyde F. Fehn from Monroe, La. to San Juan, Puerto Rico; P.A. Surgeon Robert H. English from Ann Arbor, Mich. to Headquarters, MCWA.

Asst. San. (R) Dale Lindsay has been assigned for the remainder of the season to studies in relation to poliomyelitis being conducted under the direction of the Commission on Neurotropic Virus Diseases. MCWA is further assisting in these studies by assigning two large mobile spray units with operators for use in fly control experiments. Lindsay was formerly Asst. State Entomologist for Texas. Asst. San. (R) Charles J. Rhodes has been assigned to Texas to replace Lindsay.

### DDT THERMAL AEROSOL INVESTIGATIONS

A special investigation is being conducted in the control of anopheline breeding in the Arkansas rice fields using DDT thermal aerosols. Experiments thus far indicate good possibilities for using DDT thermal aerosol as a larvicide. When used at as low a rate as .0001 lb. DDT per acre, mosquito larvae are destroyed, but other aquatic life is not injured. This method is less expensive than paris green and may prove even more effective in control.

An investigation is also being launched on experiments in aerial larvicidal applications of DDT in a wild life refuge near Savannah, Georgia. The work will be carried on by the Carter Memorial Laboratory staff.

### EMORY FIELD STATION NOTES

The mosquito staining program at the Emory University Field Station is being extended. Present results indicate about a 5% recovery of mosquitoes released in the vicinity of breeding places. Mosquitoes released near barns show less than 5% recovery. There is a slight cumulative effect in resting stations in the immediate vicinity of breeding areas, but a rapid dispersal occurs so that the only mosquitoes remaining are females engorged with blood.

Additional hydrological equipment has been installed at the Field Station for taking critical measurements of factors such as atmospheric temperature, water temperature, and humidity. These investigations will be correlated with other meteorologic observations as an expansion of the research program already under way.

The building of a new laboratory at the station is almost completed. The new building will have three biological laboratories and one chemistry laboratory, a photographic dark room, and a supply room. The outdoor insectary is to be replaced by a separate building for housing a new insectary.



## DIVISION NOTES

### MALARIA CONTROL ON IMPOUNDED WATERS MANUAL

A joint committee of TVA and MCWA personnel met in Chattanooga to discuss the pending manual "Malaria Control on Impounded Waters." The manual is to include the most modern principles and practices of malaria control on impounded waters and will present this information in a form for ready reference by professional engineers and others charged with the responsibility for applying malaria control measures on impounded waters. It will consider all the various phases of malaria control with special emphasis on the practical application of these different phases to the problem as a whole. Selected specialists associated with TVA and MCWA are preparing the various chapters of the manual.

Following is the proposed table of contents:

- Development of a Malaria Control Program
- Reservoir Preparation
- Permanent Shoreline Improvement
- Water Level Management
- Shoreline Maintenance
- Larviciding
- House Spraying
- Mosquito Proofing
- Methods of Appraisal of Malaria Control
- Malaria Mosquitoes
- Relation of Planes to Mosquito Control
- Malariology
- Small Reservoirs
- Education

The completed bulletin will consist of about 250 printed pages, with an appendix giving additional details such as specifications for equipment and regulations of various states governing the impounding of waters. The bulletin will measure about 6" x 9". It will be bound in a permanent, flexible binding and will be styled somewhat after the manual "Low Dams." It is to be illustrated with diagrams and photographs and is to be in final form ready for review by Dec. 30, 1945. P.A. San. Eng. (R) Charles Mansur, now stationed at Wilson Dam, Ala. is editing and compiling the manual.

### NEW PICTORIAL KEY TO ADULT ANOPHELINES

A new "Pictorial Key to Adult Female Anophelines of the United States" has recently been prepared and is now available for distribution. Other keys in the pictorial series include "Pictorial Key to Anopheline Larvae of the United States", and "Pictorial Key to Ectoparasites Commonly Found on Rats in Southern United States".

### NEW FILMS NOW AVAILABLE

*Power Spraying DDT*, a 15 min. black and white film strip, is designed to teach MCWA field personnel the standard methods of power spraying used in the Extended Malaria Control Program. The film strip is available to MCWA personnel and to other professional groups under special circumstances. The production number is MCWA-TE-5-002.

*Power Spraying DDT Quiz*, is a film strip to be used as a review for the preceding strip - *Power Spraying DDT*. Production number for the Quiz is MCWA-TE-5-0008.

*Your Uninvited Guest*, a 14 min. black and white popular film strip, shows where *Aedes aegypti* breeds, how it multiplies around the house, and the measures which individual householders can take to prevent *aegypti* breeding. The film is unrestricted. Its production number is MCWA-TE-5-001.

### IN-SERVICE TRAINING

The thirty-sixth In-Service Training class was completed and the thirty-seventh began during the month of June. Members of the class included Asst. Eng. (R) Byron W. Candage; Script Writer Mary Ellington; Ed. Clerk Dorothy Neill Williams; Asst. Ent. Delma E. Harding; Inf. Spec. Michael Elias and Inf. Spec. Adolf Nichtenhauser.

San. Eng. Shu-Fang Wang from North West Institute of Health at Lanchow, China, was a visitor to the In-Service Training Course. Mr. Wang is here with UNRRA. Another visitor was Asst. San. Eng. (R) Robert P. Burden. He will go to Chunking, China, with UNRRA for a period of 1½ - 3 years.



Table II

## MCWA Expenditures And Liquidations By Major Items

May 1945

	Continental U. S.	Percentage of Total	Puerto Rico	Percentage of Total
.01 Personal Services	\$551,568.94	75.58	20,636.81	90.19
.02 Travel	23,825.83	3.27	114.11	.50
.03 Transportation of Things	909.12	.12	---	---
.04 Communication Services	1,663.22	.23	12.80	.06
.05 Rents and Utilities	2,517.71	.34	---	---
.06 Printing and Binding	931.73	.13	---	---
.07 Other Contractual Services	18,209.27	2.50	35.00	.15
.08 Supplies and Material	99,942.36	13.70	2,076.18	9.07
.09 Equipment	30,120.60	4.13	5.55	.03
<b>Total</b>	<b>729,688.78</b>	<b>100.00</b>	<b>22,880.45</b>	<b>100.00</b>
Expenses other than Personal Services	178,119.84	24.41	2,243.64	9.81

Table III

## MCWA Personnel On Duty And Total Payroll

May 1945

State	Commissioned		Prof. & Sci.		Sub-Prof. (1)		C. A. F.		Custodial and Per Hour		Total		Percent of Total	
	No.	Pay	No.	Pay	No.	Pay	No.	Pay	No.	Pay	No.	Pay	No.	Pay
Alabama	4	1,282	2	527	26	4,779	---	---	65	8,667	97	15,255	2.45	2.64
Arkansas	13	3,966	4	1,160	35	6,661	6	1,180	356	45,692	414	58,599	10.45	10.13
California	4	1,104	---	---	4	872	3	623	15	2,374	26	4,973	.66	.86
District of Columbia	1	333	---	---	---	---	1	233	---	---	2	566	.05	.10
Florida	8	2,436	5	1,539	70	11,841	9	1,372	152	19,394	244	36,682	6.16	6.34
Georgia	10	3,022	1	527	74	12,980	6	1,056	85	10,899	176	28,484	4.44	4.93
Illinois	4	1,200	2	466	1	73	1	164	15	1,211	23	3,114	.58	.54
Indiana	1	285	---	---	2	385	---	---	5	491	8	1,161	.20	.20
Kentucky	4	1,189	1	416	11	2,374	3	576	21	3,991	40	8,546	1.01	1.48
Louisiana	11	3,219	4	1,256	49	9,644	7	1,275	277	36,584	348	51,978	8.79	8.99
Maryland	1	248	---	---	2	385	2	389	11	1,491	16	2,513	.40	.44
Mississippi	9	2,679	7	1,860	48	8,115	5	794	187	20,980	256	34,428	6.46	5.95
Missouri	2	550	3	478	16	2,878	---	---	157	17,417	178	21,323	4.49	3.69
North Carolina	5	1,485	5	1,561	11	2,072	4	732	150	19,584	175	25,434	4.42	4.40
Oklahoma	4	1,215	2	477	16	3,354	1	164	102	10,599	125	15,809	3.17	2.73
Oregon	---	---	---	---	1	203	---	---	---	---	1	203	.03	.00
South Carolina	11	3,307	6	1,729	48	9,658	13	1,926	406	52,369	484	68,989	12.22	11.93
Tennessee	5	1,474	2	638	18	2,930	5	897	96	11,538	126	17,477	3.18	3.02
Texas	10	2,936	4	1,333	65	11,827	9	1,592	255	32,560	343	50,248	8.66	8.69
Virginia	2	618	2	696	10	1,957	3	602	108	14,024	125	17,897	3.17	3.09
<b>AEDES AEGYPTI</b>														
Alabama	1	285	---	---	7	1,369	1	164	---	---	9	1,818	.23	.32
Florida	---	---	---	---	23	3,722	---	---	---	---	23	3,722	.58	.64
Georgia	---	---	---	---	6	1,176	---	---	---	---	6	1,176	.15	.20
Louisiana	1	285	---	---	8	1,392	1	164	---	---	10	1,841	.25	.32
South Carolina	1	285	---	---	6	1,115	1	164	---	---	8	1,564	.20	.28
Texas	4	1,140	1	153	27	5,284	2	310	1	255	35	7,142	.88	1.23
Hq. & Dist. (2)	66	22,477	11	2,868	38	6,435	153	26,341	43	6,276	311	64,397	7.86	11.13
Mobile Units	8	2,481	3	669	5	994	2	328	11	1,756	29	6,228	.73	1.08
Puerto Rico	7	2,123	2	677	10	2,187	6	1,304	265	14,346	290	20,637	7.32	3.57
Honolulu T. H.	2	589	---	---	6	1,657	3	532	21	3,447	32	6,225	.81	1.08
<b>Total</b>	<b>199</b>	<b>62,213</b>	<b>67</b>	<b>19,130</b>	<b>643</b>	<b>118,319</b>	<b>247</b>	<b>42,821</b>	<b>2,804</b>	<b>335,945</b>	<b>3,960</b>	<b>578,429</b>	<b>100.00</b>	<b>100.00</b>
<b>Percent of Total</b>	<b>5.03</b>	<b>10.76</b>	<b>1.69</b>	<b>3.31</b>	<b>16.23</b>	<b>20.46</b>	<b>6.24</b>	<b>7.40</b>	<b>70.80</b>	<b>58.08</b>	<b>100.00</b>	<b>100.00</b>		

(1) Includes Entomological Inspectors

(2) Includes Headquarters and District Offices, malaria survey, Imported Malaria Control, special investigations, and employees temporarily attached to Headquarters pending assignment to states



